

## OHIO MOSSES, HYPNALES.\*

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The present paper is the fourth on the subject of the mosses of Ohio and completes the preliminary study of the plants of that group in the state. The Hypnales have been treated in the same way as the other orders were treated in former studies. With a few exceptions, the classification and nomenclature are those used by Dr. Jennings in his Mosses of Western Pennsylvania. *Thamnum* is included with *Climacium* in the *Climaciaceæ*, following Dr. Nichols who includes them in one family which he calls *Dendroidaceæ*. In parenthesis, following the name cited, are to be found the names used by authors of the usual manuals on moss.

### HYPNALES.

Mosses which usually have the creeping habit, frequently with pinnate or sub-pinnate branching; archegonia situated at the tip of short special branches or buds, not at the apex; the so-called pleuricarpous mosses. Peristome usually double with the inner set of teeth alternating with the outer ones.

This order is extremely variable both in vegetative characteristics and habitats.

### SYNOPSIS OF THE ORDER HYPNALES.

- I. Peristome apparently simple or wanting; the inner, when present, usually incomplete.
  - A. Peristome double but with an incomplete inner peristome.
    - 1. Inner peristome of 16 filamentous teeth, imperfectly separated; no basal membrane..... *FONTINALIACEÆ* (1)
    - 2. Inner peristome of narrow segments; basal membrane low; on trees..... *NECKERACEÆ* (2)
  - B. Peristome wanting..... *HEDWIGIACEÆ* (3)
- II. Peristome double, inner well-developed, cilia wanting; calyptra mitrate..... *HOOKERIACEÆ* (4)

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- III. Peristome double, inner usually with cilia, segments keeled and often split along the median line; calyptra cucullate.
- A. Sporangium usually erect and actinomorphic.
1. Sporangium non-plicate; basal membrane present; cilia rudimentary, rare, or wanting.
    - a. Teeth non-lamellate; inner peristome rudimentary or none, LEUCODONTACEÆ (5)
    - b. Teeth with lamellæ on the inner surface.
      1. Scales usually smooth.
        - a. Prostrate to ascending; sporophytes single, ENTODONTACEÆ (6)
        - b. Dendroid; sporophytes clustered... CLIMACIACEÆ (7)
      2. Scales papillose..... LESKEACEÆ (8)
    2. Sporangium plicate, no basal membrane, inner peristome none or of subrelate segments..... FABRONIACEÆ (9)
- B. Sporangium inclined to pendent, usually zygomorphic.
1. Calyptra long-rostrate, oblique..... SEMATOPHYLLACEÆ (10)
  2. Calyptra conic, obtuse or short-rostrate.
    - a. Alar cells quadrate, not inflated; green or hyaline, BRACHYTHECIACEÆ (11)
    - b. Alar cells rounded or 4-6 sided, mostly hyaline and frequently inflated..... HYPNACEÆ (12)

## KEY TO THE FAMILIES OF HYPNALES.

1. Aquatic, ours long and floating with straight scales... FONTINALACEÆ (1)
1. Terrestrial, or if in water, with secund scales..... 2
2. Scales papillose..... LESKEACEÆ (8)
2. Scales smooth or only slightly papillose at the cell angles..... 3
3. Blackish; peristome wanting; on rocks; acrocarpous..... HEDWIGIACEÆ (3)
3. Light to dark green; peristome present; pleuricarpous..... 4
4. Segments of the inner peristome rudimentary..... 5
4. Segments of the inner peristome keeled or often split..... 7
5. Complanate, scales undulate..... NECKERACEÆ (2)
5. Terete, scales not undulate..... 6
6. Cells of the scales elongated; small soft mosses..... FABRONIACEÆ (9)
6. Cells of the scales short; coarse lax tufts; often pendent. LEUCODONTACEÆ (5)
7. Primary stems creeping, secondary stems erect and large, dendroid; sporophytes clustered..... CLIMACIACEÆ (7)
7. Primary stems prostrate or ascending; sporophytes single..... 8
8. Costate; sporangium erect, basal membrane short..... ENTODONTACEÆ (6)
8. Costate; sporangium usually inclined or curved, basal membrane broad.... 9
9. Cilia wanting; scales cells large; calyptra mitrate..... HOOKERIACEÆ (4)
9. Cilia present; scales cells small; calyptra cucullate..... 10
10. Costa double or furcate, short or lacking; not complanate; lid long-beaked..... SEMATOPHYLLACEÆ (10)
10. Costa single, or if double then plants complanate or with a conic or short rostrate lid..... 11
11. Costa single and reaching beyond the middle; usually glossy; often complanate, not secund..... BRACHYTHECIACEÆ (11)
11. Costa usually short and double, sometimes wanting; if single then plants not glossy, scales often secund..... HYPNACEÆ (10)

1. *FONTINALACEÆ*.

Aquatic mosses, long and floating, dark; scales smooth, basal cells orange.

1. *FONTINALIS* (L.) Hedw.

Scales ecostate, 3-seriate; sporangium almost immersed, oval to ovate, peristome orange to brownish.

1. Scales keeled, making the gametophore appear triangular..... *F. antipyretica*
1. Scales not keeled, but concave..... 2
2. Alar cells distinctly differentiated; summer scales different from those of the spring..... *F. biformis*
2. Alar cells not at all or only indistinctly differentiated..... 3
3. Perichaetial scales rounded at the apex, lacerate..... *F. delmarei*
3. Perichaetial scales pointed at the apex, sometimes finely lacerate; branches attenuate..... *F. delectarlica*

1. *F. antipyretica* var. *gigantea* Sull. (*F. gigantea* Sull.) Dark brownish to golden-green, irregularly branched; scales carinate, ovate-lanceolate to ovate, entire, acute; sporangium sub-sessile, emergent; peristome reddish. Summer. On wood or stones in running water. Adams, Hocking.

2. *F. delmarei* Ren. Card. Dull green, naked below, irregularly pinnate upper scales dense, oblong-lanceolate, erect-spreading, very concave sporangium sub-emergent. Running water. Auglaize, Portage.

3. *F. delectarlica* Br. & Sch. Slender, much branched, branches attenuate at the ends, dull, naked below; scales erect-spreading, oblong-lanceolate to lanceolate, entire or slightly toothed near the apex, concave, somewhat involute; sporangium immersed. Summer. On stones in running water. Hocking.

4. *F. biformis* Sull. Dark or yellowish-green, branches dense; alar cells distinctly differentiated, summer scales differing from those of spring in being smaller and narrower, convolute above, rigid; sporangium oblong-ovate; lid conic-rostrate. Streams. Portage. ("bei Columbus in Ohio," Engler and Prantle; "Central Ohio," Lesq. and Jas.)

2. *NECKERACEÆ*.

Loosely cespitose, rather stiff and robust, primary stems creeping, secondary stems pinnately branched, erect or pendent, complanate; sporangium erect, actinomorphic.

1. *NECKERA* Hedw.

Scales ecostate, smooth; inner membrane low, cilia none; calyptra with erect hairs; annulus lacking.

1. *N. pennata* (L.) Hedw. (*Fontinalis pennata* L.) Branches 2-3 in. long; scales acute, ovate-lanceolate, strongly undulate, entire or obscurely denticulate above, costa none or very faint; sporangium immersed, teeth sometimes apically united; calyptra small. Summer. On trunks of deciduous trees, sometimes on rocks. Champaign, Lake.

3. *HEDWIGIACEÆ*.

Cespitose, irregularly branched with pendent branches; scales pleuriseriate, imbricated when dry, ecostate, those on the primary stalks recurved; sporangium erect, short.

1. *HEDWIGIA* Ehrh.

Lax, glaucous-green above; scales entire, revolute, hyaline tipped, median basal cells yellowish; sporangium immersed, pale brown, mouth red.

1. *H. ciliata* Ehrh. (*H. albicans* Lindb.; *Fontinalis albicans* Web.; *Anictangium ciliatum* Hedw.) Blackish below, gametophores  $\frac{1}{2}$ -3 in. long; scales ecostate; peristome wanting. Spring. Tree trunks or noncalcaeous rocks. Butler, Clark, Fairfield, Franklin, Lake, Lawrence, Montgomery, Morgan, Scioto, Shelby.

4. *HOOKERIACEÆ*.

Small irregular, sparingly branched; scales loosely imbricated, perichaetial branch, rooting; sporangium arcuate, sub-erect to horizontal, peristome double, hypnoid, teeth lanceolate, subulate, closely articulate.

*HOOKERIA* Tayl.

Procumbent; scales acuminate, bicostate, areolation loose; outer peristome purplish, inner one orange with a basal membrane, calyptra almost entire.

1. *H. sullivantii* C. Muell. Ms. (*H. acutifolia* Sull.) Scales ovate oblong, acute, entire, yellowish-green; fruit not known. Fairfield.

5. *LEUCODONTACEÆ*.

Stiff and robust mosses, laxly cespitose, mostly shining; primary stem creeping, radiculose, secondary stems erect, ascending or pendent; scales dense, decurrent, acute; sporangium erect, actinomorphic; peristome double, basal membrane short, cilia none; lid conic, rostrate deciduous.

- 1. Costa double or none, calyptra smooth.....*Leucodon*
- 1. Costa single; calyptra hairy.....*Forsstroemia*

1. *LEUCODON* Schwaeg.

Secondary stems numerous, often pendent and curved outward; scales many-ranked, concave, margins recurved, closely imbricated when dry; inner peristome rudimentary, lid entirely covering the sporangium.

- 1. Scales ovate-elliptical, short-acuminate; sporangium exserted...*L. julaceus*
- 1. Scales ovate-lanceolate, longer acuminate; sporangium emergent...*L. brachypus*

1. *L. brachypus* Brid. Brownish to light green,  $\frac{1}{4}$ -2 in. long; scales plicate, entire or serrulate above; slightly secund; sporangium brown, dark-rimmed; lid obliquely rostrate. Late fall or winter. Trees and rocks. "Northern Ohio," H. C. Beardslee's catalog.

2. *L. julaceus* (L.) Sull. (*Hypnum julaceum* L.; *Pterigynandrum julaceum* Hedw.) Smaller than the preceding, julaceous when dry; never secund, scales concave, scarcely plicate, serrulate in the upper part. Fall. On tree trunks. Champaign, Clark, Fairfield, Franklin, Lake, Montgomery, Perry.

## 2. FORSSTRÖEMIA Lindb. (*Leptodon* Mohr.)

Green to brownish-green, usually dull; scales erect-spreading when moist, imbricated when dry, margin revolute, entire, or serrate near the apex; inner peristome none or rudimentary; lid with erect hairs.

1. Scales ecostate; sporangium scarcely exserted.....*F. trichomitrium*  
 1. Scales costate; sporangium plainly exserted.....*F. ohioensis*

1. *F. trichomitria* (Hedw.) Lindb. (*Leptodon trichomitrium* Mohr.; *Pterigynandrum trichomitrium* Hedw.) Loosely cespitose, 1-2 in. long, much branched, dull; scales dense, concave, serrate near the apex; sporangium brown, emergent. Winter. On tree trunks. Champaign, Clark, Lake, Morgan.

2. *F. ohioensis* (Sull.) Lindb. More slender and with fewer branches than the preceding; scales costate; sporangium brown, hypophysis long, lid curved rostrate. Spring. On trees. Franklin.

## 6. ENTODONTACEÆ.

Loosely cespitose, medium to large, rather robust; scales dense, smooth or slightly papillose, costa short and double or entirely wanting; sporangium erect, straight, exserted, smooth; cilia usually lacking, calyptra smooth.

1. Cells of the scales papillose.....*Schwetschkeopsis*  
 1. Scales smooth..... 2  
 2. Robust; yellow-green; scales concave, narrowed at the base.....*Entodon*  
 2. Slender, dark green; scales not narrowed..... 3  
 3. Scales acuminate, margins plane; branches curved at the tips.....*Pylaisia*  
 3. Scales acute, margins revolute; branches not curved at the tips.....*Platygyrium*

### 1. SCHWETSCHKEOPSIS Broth.

Cespitose, branches slender, yellowish-green; scales dense, concave, imbricated when dry, plicate, plane, acuminate; peristome teeth yellow, basal membrane one-third the height of the teeth, cilia rudimentary.

1. *S. denticulata* (Sull.) Broth. (*Leskea denticulata* Sull.) Soft, flat tufts  $\frac{1}{2}$ -1 in. deep, irregularly branched, flattened; scales ovate, denticulate, ecostate, seta yellowish-red, sporangium oblong, cilia wanting, lid conic-rostrate. Bases of trees or on rocks. Clark.

### 2. ENTODON C. Muell. (*Cylindrothecium* Br. & Sch.)

Yellowish-green, loosely cespitose, glossy, prostrate to ascending, pinnately branched; scales usually imbricated dorsally, spreading laterally, costa short and double or wanting, alar cells quadrate, hyaline, sporangium cylindrical straight, cilia lacking, basal membrane low.

1. Scales gradually acuminate.....*E. brevisetus* 2
1. Scales acute or abruptly acuminate, apiculate.....*E. seductrix* 2
2. Branches usually terete or julaceous.....*E. seductrix* 3
2. Branches usually flattened.....*E. seductrix* 3
3. Scales acute but not acuminate; teeth with more than 20 articulations,  
*E. compressus*
3. Scales acuminate-apiculate, teeth with less than 20 articulations,  
*E. cladorhizans*

1. *E. seductrix* (Hedw.) C. Muell. (*Neckera seductrix* Hedw.; *Cylindrothecium seductrix* Sull.) Robust, 1 in. or more long; scales appressed, oblong elliptical to ovate-apiculate, tip often reflexed, margin plane, entire or obscurely denticulate near the apex; seta purple, sporangium golden-brown, hypophysis abrupt, peristome inserted below the mouth, teeth papillose. Autumn. Rotten wood, rocks, bases of trees, and soil. Clark, Fairfield, Franklin, Greene, Hamilton, Hardin.

2. *E. brevisetus* (Hook. & Wils.) Jaeg. (*Cylindrothecium brevisetum* Wils.) Soft slender; scales acuminate, long; seta three-eighths to one-half in. long, copper-colored; sporangium golden-brown, neck tapering, segments of the inner peristome adherent to the teeth; lid small, obliquely rostrate. Autumn. On logs. Champaign, Clark.

3. *E. cladorhizans* (Hedw.) C. Muell. (*Cylindrothecium cladorhizans* Schimp.; *Neckera cladorhizans* Hedw.). Large flattened tufts, very glossy; scales oblong-ovate, faintly serrulate near the apex, apex often reflexed; teeth not papillose; seta castaneous, lustrous, base of the sporangium abrupt. Autumn and early winter. On logs. Clark.

4. *E. compressus* (Hedw.) C. Muell. (*Cylindrothecium compressum* Br. & Sch.). Gametophores much compressed, more slender than the last species; scales entire; sporangium ovate to elliptical, short, lid curved, rostrate, peristome teeth closely articulate, papillose. Autumn and early winter. Bases of trees. Franklin.

### 3. PLATYGYRIUM Br. & Sch.

Cespitose in flat mats, dark to bright green; scales decurrent, acute to acuminate, ecostate; lid conic.

1. *P. repens* (Brid.) Br. & Sch. (*Pterogonium repens* Schwaeg.; *Anomodon repens* Fuern.; *Cylindrothecium repens* DeNot). Primary stems creeping, radiculose below, branches short, julaceous; scales imbricate when dry, margins revolute below; seta about  $\frac{3}{4}$  in. long, copper-colored, lustrous, sporangium golden brown, cylindrical, hypophysis tapering, teeth hyaline bordered. Autumn. Tree trunks and decaying wood. Champaign, Clark, Franklin, Lake.

### 4. PYLAÏSIA Br. & Sch.

Flatly cespitose, branches short and curved at the tips when dry; scales imbricated when dry, erect-spreading and secund when moist, concave, ovate to ovate-lanceolate, acuminate, costa double and very short or none; seta  $\frac{1}{4}$ – $\frac{1}{2}$  in. long, sporangium erect, cylindric, cilia none, segments often adherent to the teeth.

1. Segments of endostome free from the teeth, membrane distinct; operculum beaked.....*P. subdenticulata*
1. Segments adherent to the teeth, lid conic; membrane low or wanting..... 2
2. Segments completely adherent; quadrate alar cells few.....*P. intricata*
2. Segments partly adherent; quadrate cells bordering one-third of the scales.....*P. schimperi*

1. *P. intricata* (Hedw.) Ren. & Card. (*P. velutina* Br. & Sch.; *Pylaisiella velutina* Lindb.; *Pterygynandrum intricatum* Hedw.). Light, flat, dense mats; scales lanceolate, long-acuminate, falcate-second, ecostate; seta straight, light brown, about three-sixteenths inches long; sporangium ovoid-cylindric, castaneous. Autumn. On stumps and bases of trees. Champaign, Clark, Franklin.

2. *P. schimperi* Card. (*P. intricata* Br. & Sch.; *Pylaisiella intricata* Grout). Thin dense mats, dark green; scales dense, decidedly falcate-second, ovate-lanceolate, long-acuminate, alar cells yellowish, incrassate; seta about  $\frac{1}{2}$  in. long, reddish; sporangium ovoid-oblong, small-mouthed. Autumn. Tree trunks and decaying wood. Clark, Lake, Perry.

3. *P. subdenticulata* Br. & Sch. (*Pylaisia denticulata* Sull.). Yellowish-green, flat mats, much branched; scales ovate-lanceolate, ecostate, or costa very faint and short, entire below, sub-denticulate above; sporangium oblong. Autumn. Tree trunks, wood and stones. Clark.

#### 7. CLIMACIACEÆ.

Large mosses, with erect branches from a creeping caudex, dendroid; scales 3 or more ranked, smooth, rarely slightly papillose at the angles; sporophytes clustered, peristome with articulate teeth, segments of the inner peristome carinate, often split along the keel.

1. Sporangium erect and actinomorphic; peristome without cilia.....*Climacium*
1. Sporangium curved, cernuous; peristome with cilia.....*Thamnum*

##### 1. CLIMACIUM Web. & Mohr.

Large, tree-like, branchlets simple and clustered near the top of the main erect branch, papaphyllia numerous; scales decurrent, auricles lanceolate, acute, sharply serrate in the outer portion; sporangium cylindric, castaneous, teeth with a dark red border, inner peristome orange, calyptra long, enclosing the sporangium, split at one side.

1. *C. americanum* Brid. Loosely cespitose, 2-5 in. deep, yellowish-green, lustrous, primary branches erect bearing ovate, closely imbricated scales below and a tuft of branchlets above; branch scales broad lanceolate, serrate in the outer portion, erect-spreading, imbricated when dry, costa strong, almost to the apex; seta erect, 1-1½ in. long, castaneous, sporangium erect or slightly curved, slightly constricted below the mouth when dry, lid slender rostrate. Autumn. Soil, rocks, and logs in swamps. Adams, Champaign, Clinton, Franklin, Galion, Hancock, Meigs, Montgomery, Ottawa, Portage, Richland, Ross, Scioto, Seneca, Shelby, Stark, Summit, Vinton, Williams.

## 2. THAMNIUM Br. & Sch.

Robust mosses with erect branches, tree-like, with a cluster of branchlets at the top, spreading, curved; scales erect-spreading, serrate, costa strong, ending below the apex; seta red, smooth sporangium inclined to horizontal, somewhat arcuate, gibbous peristome yellow, teeth bordered, lid, conic-rostrate, calyptra cucullate.

1. *T. allegheniensis* (C. Muell.) Br. & Sch. (*Hypnum allegheniensis* C. Muell.; *Porotrichum allegheniensis* Grout). Large, 1½–3 in. deep, bright or pale green, lustrous; scales oblong-elliptical, short acuminate, or acute base narrow, margin plane, sharply serrate in the outer portion; seta about ½ in. long, sporangium castaneous, oblong cylindric, lid one-third to one-half as long as the urn. Autumn. Dripping ledges in ravines. Greene, Lake.

## 8. LESKEACEÆ.

Cespitose, usually dull and stiff; scales rarely uniform, usually costate; basal portions smoother than the outer.

1. Primary stems stoloniferous; archegonial clusters borne on the branches.... 2
1. Not stoloniferous; archegonial clusters borne on the main stems..... 3
2. Slender mosses; costa ending at or below the middle of the scale,  
*Haplohymenium*
2. More or less robust mosses; costa reaching nearly or quite to the apex,  
*Anomodon*
3. Costa single, strong, nearly or quite to the apex..... 4
3. Costa short, single or double or lacking..... 8
4. Scales of primary stems and branches similar; 2–4 or no papillæ on the  
terminal cell..... 5
4. Scales of primary stems and branches dissimilar; one papilla on the  
terminal cell..... 7
5. Sporangium erect or nearly so; cilia rudimentary..... *Leskea*
5. Sporangium arcuate; cilia complete..... 6
6. Cells smooth or slightly papillose; cilia smooth..... *Elodium*
6. Cells strongly papillose on both surfaces; cilia nodose or appendiculate,  
*Haplocladium*
7. Medium-sized mosses; paraphyllia branched; cells with 2–5 papillæ on each  
surface; lid short-rostrate..... *Rauia*
7. Paraphyllia simple or if branched then large mosses, lid long-rostrate,  
*Thuidium*
8. Irregularly bushy branched; costa wanting or very short; cilia two..... *Myurella*
8. Pinnately simple branched; costa distinct; cilia none..... *Thelia*

## 1. THÈLIA Sull.

Densely cespitose, dull, glaucous, julaceous, creeping, branches closely pinnate; scales imbricated, concave, broadly ovate, margins with long slender teeth, costa short, cells each with one large dorsal papilla; perichaetial scales with long marginal cilia, oblong; seta slender, reddish; sporangium erect, actinomorphic, inner peristome with a basal membrane and short segments.

1. Papillæ simple, curved..... *T. hirtella*
1. Papillæ branched or forked..... 2
2. On trees; scales ciliated..... *T. asperella*
2. On soil; scales not ciliated..... *T. lescurii*



1. *T. hirtella* (Hedw.) Lindb. (*Pterigynandrum hirtellum* Hedw.; *Hypnum hirtellum* C. Muell.) Thin mats, light above, radiculose below; scales sub-orbicular, margins spinulose-dentate above, ciliate below, abruptly acuminate, lid rostrate. Autumn. Tree trunks and roots. Champaign, Clark, Franklin, Lake, Montgomery.

2. *T. asperella* Sull. (*Leskea asprella* Br. & Sch.) Light glaucous green; scales long-ciliate, long-acuminate; seta red, about  $\frac{1}{2}$  in. long; sporangium oblong cylindric, pale; peristome whitish. Autumn. Tree bases. Clark, Franklin, Montgomery, Ottawa.

3. *T. lescarii* Sull. Fasciculately branched, light claucous green; scales short-acuminate; seta reddish, over  $\frac{1}{2}$  in. long; sporangium reddish-brown. Autumn. On sandy soil and rocks. Not reported, but is probably to be found.

## 2. MYURELLA Br. & Sch.

Soft loose mats of very slender branches, irregularly branched, light to bright bluish-green, sometimes flagellate at the apex; scales imbricate, concave, broad-ovate, smooth or dorsally mamillate; seta red, sporangium erect or slightly inclined when old, constricted below the mouth, cilia present.

1. Scales serrulate-dentate; obtuse or short-apiculate.....*M. julaceae*  
 1. Scales spinulose-dentate abruptly long-acuminate.....*M. gracilis*

1. *M. julacea* (Vill.) Br. & Sch. (*Hypnum julaceum* Vill.) Light green, branches filiform, julaceous; scales dense, imbricated, costa indistinct; sporangium rarely found, oblong-elliptical; peristome yellow. July-August. In crevices of rocks. Not reported.

2. *M. gracilis* (Weinm) Lindb. (*M. careyana* Sull.) Pale, glaucous-green; scales not so dense and more spreading than in the preceding species; papillæ large and simple, costa short; rarely fruiting. Damp crevices in limestone. Cuyahoga, Greene.

## 3. HAPLOYMENIUM Doz. & Molk.

Stiff, stems creeping with pinnate branches forming a thin mat; upper scales spreading to squarrose, imbricated when dry; base of scales concave, clasping, more or less abruptly narrowed, broadly ligulate, entire, costa to the middle of the scale or beyond; sporangium brown, erect.

1. *H. tristis* (Cesat. Lindb.) (*Leskea tristis* Cesat.; *Anomodon tristis* Sull.) Small, mats thin, very slender, dull green, irregularly pinnate; scales imbricated when dry, spreading-squarrose when moist, blunt, several papillæ on each face of the cell; fruit not yet found. Champaign, Clark, Lake.

## 4. ANOMODON Hook. & Taylor.

Coarse, robust, lax mats, dull; primary stems creeping, secondary erect to ascending; scales dense, plane, densely papillose on both surfaces; costa simple and strong; seta erect, sporangium erect, not narrowed below the mouth.

1. Branches attenuate.....*A. attenuatus*
1. Branches not attenuate..... 2
2. Scales narrowly acuminate, ending in a hair point.....*A. rostratus*
2. Scales ligulate from a broader base..... 3
3. Scales apiculate, auricled.....*A. apiculatus*
3. Scales with rounded apex, not auricled.....*A. minor*

1. *A. apiculatus* Br. & Sch. (*Leskea apiculata* Schimp.; *Hypnum rugelii* C. Muell.) Somewhat glaucous, reddish-brown below, stems 1-2 in. long, upper margins involute, entire, crisped when dry, costa ending below the apex; seta about  $\frac{1}{4}$  in. long, brown; sporangium ovate-cylindrical, castaneous; peristome segments rudimentary, basal membrane low. Autumn. On shaded rocks and bases of trees. Lake:

2. *A. minor* (Hedw.) Fuern. (*A. obtusifolius* Br. & Sch.) Branches 1-2 in. long, claucous, brownish when old; scales somewhat complanate, entire, densely papillose, costa strong, ending below the apex; seta  $\frac{1}{4}$ - $\frac{1}{2}$  in., sporangium cylindric-oblong, mouth contracted, lid conic, oblique-rostrate, peristome hyaline. Late autumn and winter. Bases of trees and rocks. Clark, Franklin, Lake.

3. *A. attenuatus* (Schreb.) Hueben. (*Leskea attenuata* Hedw.; *Hypnum attenuatum* Schreb.) Slender mosses, more densely tufted than the two preceding species, wide, many branches flagellate; scales lanceolate, acute, minutely apiculate, costa ending below the apex; seta about  $\frac{3}{8}$  in., brown, sporangium cylindric, castaneous, peristome segments narrow. Autumn. Rocks, trees, stumps in the shade. Belmont, Clark, Fairfield, Hamilton, Hancock, Lake, Seneca.

4. *A. rostratus* (Hedw.) Schimp. (*Leskea rostrata* Hedw.) Wide, dense tufts of very slender branches, yellowish-green; scales long-acuminate complanate, margins often recurved; seta  $\frac{1}{4}$ - $\frac{3}{8}$  in., brown; sporangium oblong-ovoid, brown, short; lid conic, basal membrane high. Autumn. On rocks and at the bases of trees. Clark, Fairfield, Franklin, Portage, Seneca, Union, Williams.

#### 5. LÉSKEA Hedw.

Small, loosely cespitose, dark green mosses, stalks prostrate with short erect branches; scales dense, imbricated when dry, sporangium oblong-cylindrical, cilia rudimentary or none, basal membrane low; calytra smooth, cucullate.

1. Scales ovate-lanceolate, acute to long-acuminate, somewhat secund,  
*L. polycarpa*
1. Scales ovate, acute to obtuse, not secund..... 2
2. Scales revolute, 2-plicate.....*L. gracilescens*
2. Scales plane, non-plicate.....*L. obscura*

1. *L. polycarpa* Ehre. Hedw. (*Hypnum medium* Dicks.) Mats thin, dull green; scales loosely imbricated when dry, entire, basal margins recurved, apex often obliquely pointed; seta about  $\frac{1}{8}$  in., sporangium light brown. Summer. Bark, wet wood or stones or damp earth. Ashtabula, Franklin, Montgomery, Morgan.

2. *L. gracilescens* Hedw. Branches erect, simple, numerous; scales closely imbricated when dry, acute, entire; peristome whitish. Early summer. Moist tree bases and wood. Not reported.

3. *L. obscura* Hedw. (*L. nervosa* Sull.; *L. microcarpa* Schimp.) Erect branches, divided and fewer than in the preceding species; scales spreading when moist, incurved, appressed when dry, apex sub-acute to obtuse, concave, entire or serrulate; seta  $\frac{1}{2}$ - $\frac{3}{4}$  in., peristome yellowish. Early summer. Wet stones, logs and roots of trees. Lake, Morgan.

#### 6. RAUIA Aust.

Dull, dark green, pinnately branched, julaceous; scales erect-spreading, imbricated when dry, stem scales triangular to cordate, entire, long-acuminate, branch scales ovate-lanceolate, appressed, pale, seta slender, reddish; sporangium light brown, inner peristome with wide basal membrane, lid conic, short-rostrate.

1. *R. scita* Aust. (*Hypnum scitum* Beauv.; *Thuidium scitum* Aust.) Densely pinnate; sporangium oblong-cylindrical, straight or slightly arcuate, erect or inclined. Teeth pale. Autumn and winter. Bases of trees. Clark, Erie.

2. *R. scita aestivale* (Lesq. & Jas.) (*Thuidium aestivum* Aust.; *T. scitum* var. *aestivale* Aust.; *Hypnum scitum aestivale* Lesq. & Jas.) Less densely branched sporangium, horizontal, teeth yellowish, sporangium abruptly and very short rostrate. Bases of trees. Autumn and winter. Clark, Erie.

#### 7. HAPLOCLADIUM C. Muell.

Thin mats, dull, creeping pinnately branched, branches usually simple, ascending; scales erect-spreading when moist, appressed when dry; paraphyllia branched, numerous; scales lanceolate to lance-subulate, base revolute, upper part faintly serrate to entire, costa strong, almost or quite to the tip, acute to acuminate; seta  $\frac{1}{8}$ - $\frac{1}{2}$  in. long, reddish; sporangium inclined to horizontal, more or less arcuate, contracted below the mouth when dry, peristome yellow, cilia complete, calyptra conic.

- 1. Scales ovate, abruptly rounded, short-acuminate.....*H. virginianum*
- 1. Scales ovate, gradually long-acuminate.....*H. microphyllum*

1. *H. virginianum* (Brid.) Broth. (*Thuidium virginianum* Lindb.; *Hypnum gracile* var. *lancastriense* Sull. & Lesq.; *Thuidium gracile lancastriense* Card.) Dark green; scales ovate, concave, serrulate in the outer part, erose-dentate below, costa into the acumen; perichaetial scales light, lanceolate; seta castaneous, sporangium castaneous, curved, constricted below the mouth when dry; lid short-beaked. Spring. Ground or roots of trees in the open woods. Reported from Ohio by Lesquereux.

2. *H. microphyllum* (Sw.) Broth. (*Hypnum gracile* Br. & Sch.; *Thuidium microphyllum* Best; *Thuidium gracile* Br. & Sch.) Pale or yellowish-green; pinnately branched; scales ovate to lance-ovate, margins entire or sinuate-dentate, costa almost to the tip; seta about  $\frac{3}{4}$  in. long, castaneous, sporangium light brown, oblong, curved, lid short-conic. Earth, rotten wood, stones and tree bases. Summer. Clark.

## 8. THUÏDIUM Br. &amp; Sch.

Slender to robust, stiff, dull to light green, pinnately branching to form frond-like gametophores; scales erect-spreading when moist, incurved or appressed when dry, plicate, base narrow and recurrent, branch scales lance-ovate, perichaetial scales paler, lanceolate; sporangium more or less arcuate, constricted below the mouth when dry; seta slender, red or castaneous; lid conic, oblique rostrate; calyptra cucullate.

1. Plants less than 2 in.; paraphyllia unbranched, few..... 2
1. Plants over 2 in.; paraphyllia numerous, branched..... 3
2. Branches papillose;  $\frac{1}{8}$ – $\frac{3}{8}$  in. tall..... *T. pygmaeum*
2. Branches smooth;  $\frac{1}{8}$ – $1\frac{1}{2}$  in. tall..... *T. minutulum*
3. Simply pinnately branched; erect or ascending in tufts..... 4
3. Bipinnately branched; prostrate in mats..... 5
4. Plants rigid; on dry stones or sterile soil; apical cell of the branch scale papillose..... *T. abietinum*
4. Plants soft on wet swampy soil; a spical cell of the branch scale not papillose..... *T. blandowii*
5. Scales recurved, spreading when moist, margin plane, costa percurrent, *T. recognitum*
5. Scales erect-spreading when moist, margin revolute, costa ending below the apex..... *T. delicatulum*

1. *T. pygmaeum* Br. & Sch. (*Hypnum pygmaeum* Sull.) Delicate,  $\frac{1}{8}$ – $\frac{1}{2}$  in., creeping, forming delicate patterns over the substratum, branches papillose, paraphyllia on the branches; scales triangular-ovate; seta  $\frac{1}{4}$ – $\frac{1}{2}$  in., sporangium oblong-ovate, calyptra oblique-rostrate. Late summer and early autumn. Rocks and earth in moist shade. Ashtabula, Clark, Franklin.

2. *T. minutulum* (Hedw.) Br. & Sch. (*Hypnum minutulum* Hedw.) Irregularly branched, branches smooth, paraphyllia on the branches and main stems; stem scales distant, deltoid, acuminate, costa to near the apex, branch scales ovate-acuminate, costa shorter, perichaetial scales lanceolate; seta about  $\frac{3}{4}$  in., copper-colored, sporangium ovate-oblong, cernuous, operculum oblique-rostrate. Autumn. Rotten wood and bases of trees. Clark.

3. *T. delicatulum* (L.) Mitt. (*Hypnum delicatulum* L.) "Common Fern Moss." Thick mats, bright green at the tips of the gametophores, darker below, bipinnately or tripinnately branched, forming fronds, procumbent; stem scales triangular, margins somewhat recurved, erect-spreading when moist, appressed when dry, serrate, acuminate, margins somewhat recurved; branch scales broad-ovate, smaller; perichaetial scales ciliate on the margins; seta 1– $1\frac{1}{2}$  in. long, lustrous, castaneous; sporangium oblong, arcuate, castaneous, operculum conic-rostrate. Winter. Soil, rocks or wood in moist woods. Champaign, Lake, Vinton.

4. *T. recognitum* (Hedw.) Lindb. (*Hypnum recognitum* Hedw.; *Thuidium delicatulum* Br. & Sch.) Yellowish-green, mostly bipinnately branched, stem-scales broadly deltoid, auricled, cordate, abruptly acuminate, spreading-recurved when moist, sulcate when dry, margins usually plane; perichaetial scales without cilia; seta 1– $1\frac{1}{2}$  in. long, lustrous sporangium oblong, arcuate, castaneous, lid short-rostrate.

Summer. Soil, wood, and rocks in moist woods. Champaign, Clinton, Fairfield, Franklin, Licking, Lawrence, Logan, Morgan, Summit.

5. *T. abietinum* (L.) Br. & Sch. (*Hypnum abietinum* L.) "Wiry Fern Moss." Large stiff mosses forming loose mats 2-3 in. deep, simple pinnate; paraphyllia short, dark green; stem scales ovate, acuminate, biplicate, serrulate, recurved, appressed when dry, costa to  $\frac{3}{4}$  the length of the scale; sporangium narrow, cylindric, cernuous. Not seen in fruit. On dry rocky ledges and sterile soil. Not reported from Ohio.

6. *T. blandowii* (Web. & Mohr.) Br. & Sch. (*Hypnum blandowii* Web. & Mohr.) Pale or yellowish-green, in soft loose mats, 2-4 in. deep, paraphyllia long and branched, numerous, gametophores simply pinnate, branches slender; stem scales acuminate, ovate-deltate, dense, thin, costa  $\frac{1}{2}$  the length of the scale; seta copper-colored,  $1\frac{1}{2}$ -2 in. long; sporangium curved, oblong-cylindric, contracted below the mouth when old, lid conic. Summer. Wet swampy soil. Reported by Sullivant from "Ohio."

#### 9. ELÓDIUM (Sull.) Warnst.

Large yellowish-green to brownish mosses, simple or pinnately branching; scales erect-spreading when moist, appressed when dry, concave, plicate, acuminate, revolute, costa ending below the apex; perichaetial scales narrow, erect; sporangium arcuate, oblong-cylindrical, brown, peristome yellow, teeth confluent at the base, hyaline bordered, basal membrane high, lid conic, calyptra cucullate.

1. *E. paludosum* (Sull.) Loeske. (*Hypnum paludosum* Sull.; *Thuidium paludosum* Jaeg. & Sauer.) Irregularly pinnate, yellowish-green, creeping, branches erect or ascending, 1-1 $\frac{1}{2}$  in. long; scales oblong-lanceolate, only slightly papillose, paraphyllia numerous, branched; seta  $\frac{1}{2}$ -1 in. long, reddish, sporangium inclined to horizontal, about 3 to 1; operculum apiculate. Winter. Swampy ground. Fulton.

#### 9. FABRONIACEÆ.

Bright or light green, cespitose, red radiculose, small soft mosses; scales dense, appressed when dry, non-plicate, erect-spreading when moist, ovate to lanceolate; sporangium exserted, erect, actinomorphic, ovoid to short-cylindrical; calyptra cucullate, smooth.

1. Scales with simple costa; inner peristome of filiform divisions....*Anacamptodon*
1. Scales ecostate; inner peristome wanting.....*Habrodon*

#### 1. ANACÁMPTODON Brid.

Scales somewhat secund, ovate, long-acuminate, entire, costa to above the middle, oblong; sporangium with short neck, constricted below the mouth when dry; inner peristome without basal membrane.

1. *A. splachnoides* (Froel.) Brid. (*Campylodontium hypnoides* Schwaeg.; *Neckera splachnoides* Schwaeg.) Bright green, seta and sporangium reddish-brown, teeth lighter brown, in pairs, reflexed when dry. Early summer. On moist decaying wood or decaying places in living trees. Clark.

2. *HABRODON* Schimp.

Creeping, irregularly branched, leafy branches julaceous; scales entire or slightly crenulate, cell walls thick; sporangium ovoid.

1. *H. purpusillus* (DeNot) Lindb. (*H. notarisii* Schimp.) "Tree trunks in central Ohio." Reported by W. S. Sullivant (L. & J. Manual). No specimen in the herbarium.

10. *SEMATOPHYLLACEÆ*.

Cespitose, often lustrous, creeping to ascending, irregularly branched; scales pleuriseriate, costa double, very short or none, one row of basal cells inflated; inner peristome free, basal membrane high; antheridial clusters gemmiform.

1. *RAPHIDIOSTEGIUM* (Br. & Sch.) DeNot.

Densely cespitose, creeping, irregularly pinnately branched; scales erect-spreading, non-plicate, concave, ecostate or costa double and very short; sporangium suberect to horizontal, peristome hypnoid, calyptra long-subulate-rostrate, teeth yellowish, hyaline-bordered.

1. Plants on trees; sporangium erect or nearly so; scales secund. . . . *R. adnatum*
1. Plants on stones; sporangium inclined to horizontal, scales erect-spreading or slightly secund. . . . . *R. carolinianum*

1. *R. adnatum* (Mx.) Br. & Sch. (*Leskea adnata* Mx.; *Rhynchostegium microcarpum* Jaeg.; *Hypnum microcarpum* C. Muell.; *Sematophyllum adnatum* E. G. Britt.) Small, thin mats, green to golden-green, branches often curved, short, suberect; scales dense, imbricated when dry, oblong-lanceolate, short-acuminate, margin reflexed, almost entire; sporangium erect, not at all or only slightly zygomorphic, oblong-ovate, mouth reddish, slightly constricted below, castaneous, seta about  $\frac{1}{4}$  in. long. Summer and early autumn. Champaign.

2. *R. carolinianum* (C. Muell.) Jaeg. (*Hypnum carolinianum* C. Muell.; *Sematophyllum carolinianum* E. G. Britt.; *Hypnum demissum* Wils var. *carolinianum* Lesq. & Jas.) Dark yellowish or dirty green, small tufts, branches ascending to erect; scales imbricated, sub-secund or complanate, non-plicate, ovate-lanceolate, slightly serrulate near the apex, margins reflexed; seta castaneous, about  $\frac{1}{2}$  in. long, sporangium curved, constricted below the mouth when dry, mouth red. Summer and early autumn. Wet, non-calcareous rocks in ravines. Clark, Summit.

11. *BRACHYTHECIACEÆ*.

Creeping, branches procumbent or ascending; scales erect-spreading to appressed, often complanate, sometimes secund; stem and branch scales unlike, plicate or sulcate, ovate to lanceolate, acuminate, alar cells often hyaline, not inflated, paraphyses filiform; sporangium ovoid, cernous, lid conic to long-rostrate, antheridia in gemmiform clusters.

- |   |                        |
|---|------------------------|
| 1. Sporangium erect and actinomorphic.....                                    | <i>Homalotheciella</i> |
| 1. Sporangium inclined to horizontal, zygomorphic.....                        | 2                      |
| 2. Scales deeply grooved.....   | <i>Camptothecium</i>   |
| 2. Scales not at all or only slightly grooved.....                            | 3                      |
| 3. Alar cells differentiated; lid conic.....                                  | <i>Brachythecium</i>   |
| 3. Alar cells few or none; lid long-beaked.....                               | 4                      |
| 4. Cells elongated, rhomboidal or hexagonal, somewhat rough.....              | <i>Brynhia</i>         |
| 4. Cells short, smooth.....   | 5                      |
| 5. Complanate; seta smooth.....   | <i>Rhynchostegium</i>  |
| 5. Scales spreading or imbricated; seta usually rough.....                    | 6                      |
| 6. Scales very concave; abruptly piliferous-acuminate.....                    | <i>Cirriphyllum</i>    |
| 6. Scales plane or slightly concave; gradually acuminate, not piliferous..... | 7                      |
| 7. Plicate, usually somewhat concave.....                                     | <i>Eurynchium</i>      |
| 7. Non-plicate, plane or only slightly concave, seta smooth in our species,   | <i>Oxyrynchium</i>     |

### 1. HOMALOTHECIELLA (Card.) Broth.

Small, soft, glossy mosses, loosely cespitose with creeping stems, branches short, numerous, curved at the ends when dry; scales erect-spreading when moist, imbricated when dry, concave, non-plicate, lanceolate to acuminate, costa simple, alar cells green, quadrate; seta castaneous, rough; inner peristome shorter than the outer, yellow, cilia none; lid long-rostrate.

1. *H. subcapillata* (Hedw.) Broth. (*Homalothecium subcapillatum* Sull.) Light yellowish green mats; scales smooth, costa ending near the middle, abruptly long-acuminate, somewhat serrate above, alar cells extending up  $\frac{1}{4}$  of the margin; sporangium slightly curved and constricted below the mouth, somewhat gibbous, peristome teeth red with a median pellucid line, segments adhering to the teeth. Autumn. Tree trunks and logs in the woods. Clark.

### 2. CAMPTOTHECIUM Br. & Sch.

Large, loosely cespitose, yellowish-green glossy mosses; gametophores branching pinnately; scales erect-spreading when moist, concave, strongly plicate, ovate-lanceolate, acuminate, serrulate, costa simple, alar cells quadrate; seta castaneous, usually rough, sporangium cernuous, gibbous; peristome teeth confluent, bordered, inner peristome free, the same length as the outer.

1. *C. nitens* (Schreb.) Schimp. (*Hypnum nitens* Schreb.) Bright yellowish, lustrous, with brown felted radicles 2-3 in. tall; scales elongate-lanceolate, margins revolute, alar cells few, somewhat secund; sporangium arcuate. Late spring. Wet, swampy soil. Reported from southern Ohio by Lesquereux. No specimen in the herbarium.

### 3. BRACHYTHECIUM Br. & Sch.

Wide flat mats, creeping or almost procumbent; scales dense, stem scales erect-spreading to spreading, plicate, lanceolate, acuminate, margins plane, costa simple, alar cells quadrate to somewhat elongated, not well defined; sporangium cernuous, gibbous, horizontal, ovate to oblong, dark colored; peristome teeth confluent at the base, inner peristome free, yellowish, basal membrane wide, cilia nodose or appendiculate, lid conic.

1. Seta smooth..... 2
1. Seta rough, at least above..... 5
2. Scales not plicate or striate; lanceolate to lance-ovate..... *B. acutum*
2. Scales plicate, ovate-lanceolate to ovate..... 3
3. Sporangium erect, straight or nearly so; cilia rudimentary or lacking,  
*B. acuminatum*
3. Sporangium more or less inclined; cernuous; cilia well-developed..... 4
4. Sporangium sub-erect; only slightly curved, 3-4: 1..... *B. oxycladonm*
4. Sporangium strongly inclined; much curved, 2-3: 1..... *B. salebrosum*
5. Costa percurrent or nearly so..... *B. populeum*
5. Costa ending near the middle..... 6
6. Seta rough only above; scales ovate-lanceolate..... 7
6. Seta rough throughout; scales ovate..... 8
7. Scales plicate, long and slenderly acuminate..... *B. campestre*
7. Scales non-plicate, shorter, often secund..... *B. plumosum*
8. Very short-acuminate, dendroid, basal cells hyaline, well defined, forming  
auricles..... *B. rivulare*
8. Gradually slender-acuminate, non-dendroid, basal cells greenish, not  
distinctly auricled..... *B. rutabulum*

1. *B. salebrosum* (Hoffm.) Br. & Sch. (*Hypnum salebrosum* Hoffm.; *Hypnum plumosum* Huds.) Yellowish-green mats, irregularly branched; scale ovate-lanceolate, abruptly acuminate, concave, decurrent; seta about  $\frac{3}{4}$  in. long, castaneous, twisted, sporangium arcuate, horizontal, inner peristome about the same height as the teeth, cilia nodose, basal membrane one-third the height of the teeth. Autumn. Cosmopolitan in shady places. "Common," H. C. Beardsley's catalog. No specimen.

2. *B. campestre* (Bruch.) Br. & Sch. (*Hypnum campestre* Bruch.) Similar to *B. salebrosem* except for the seta's being rough above. Winter. Earth, rocks and rotting logs. Not reported.

3. *B. oxycladon* (Brid.) Jaeg. (*B. laetum* Br. & Sch.; *Hypnum oxycladon* Brid.) Yellowish-green, broadly and laxly cespitose; scales lanceolate, gradually acuminate, deeply plicate, margins finely serrulate, decurrent; seta castaneous,  $\frac{3}{4}$ -1 in. long, sporangium brown. Autumn. Rocks, earth and tree bases in woods. Clark, Perry.

4. *B. acutum* (Mitt.) Sull. (*Hypnum acutum* Mitt.) Glossy, yellowish-green lax, branchlets short; scales erect-spreading, not striate or plicate, only slightly concave, finely serrulate to entire; auricled; seta flexuous, sporangium ovoid-oblong, inclined to horizontal, somewhat arcuate. Late fall. Earth and rotting logs in swampy woods. Champaign, Lake.

5. *B. rutabulum* (L.) Br. & Sch. (*Hypnum rutabulum* L.) Robust, glossy, yellowish-green, creeping, branches somewhat attenuate; scales ovate, acuminate, slightly decurrent, faintly serrulate, scarcely concave; seta castaneous, about 1 in. in length, sporangium castaneous, oblong-ovoid, arcuate, almost horizontal, teeth slender, basal membrane one-half the height of the segments. Early winter. In moist woods on earth, stones, logs and tree bases. Champaign, Clark, Erie.

6. *B. rivulare* (Bruch.) Br. & Sch. (*Hypnum rivulare* Bruch.; *B. flavescens* Lindb.) Robust, bright to yellowish-green, variable, branches somewhat erect and dendroid; scales distant, ovate, erect-spreading, concave, decurrent, acute to acuminate, plicate, branch



scales more ovate-lanceolate; seta  $\frac{3}{4}$ -1 in. in length, castaneous, sporangium arcuate, strongly inclined to horizontal, lid acuminate. Early winter. On rocks in water or the margin of streams where they are often submerged. Lake, Licking.

7. *B. populeum* (Hedw.) Br. & Sch. (*Hypnum populeum* Hedw.) Slender, densely cespitose, dark to yellowish-green, creeping with branches ascending and curved; scales erect to erect-spreading when moist, nonstriate, imbricated when dry, ovate-lanceolate, slenderly acuminate, slightly decurrent, costa strong nearly to the apex, margin serrate to almost entire; seta castaneous, about  $\frac{1}{2}$  in. long, sporangium curved, ovoid-oblong. On shady soil, rocks, roots and bases of trees in woods. Not reported.

8. *B. acuminatum* (Hedw.) Kindb. (*Leskea acuminata* Hedw.; *Hypnum acuminatum* Beauv.) Densely cespitose, glossy, dark to yellowish-green, prostrate creeping, branches short, plumose to somewhat julaceous; scales erect-spreading, narrowed at the base, somewhat decurrent, slightly plicate, costa to the middle, alar cells quadrate; seta castaneous, about  $\frac{1}{2}$  in. long, sporangium cylindrical, erect, slightly arcuate, teeth narrow, hyaline above, cilia rudimentary or none. Autumn. Decaying wood, rocks, roots and bases of trees in the woods. Clark, Franklin, Perry.

9. *B. plumosum* (Sw.) Br. & Sch. (*Hypnum plumosum* Sw.; *Hypnum flagellare* Hedw.; *B. flagellare* Jenn.) Loosely cespitose, brown beneath, creeping with ascending to erect branches; scales erect or imbricated, lance-ovate, abruptly acuminate, costa ending near the middle, decurrent, serrate to entire, slightly decurrent; seta castaneous, stout; sporangium oblong-ovoid, dark, horizontal to almost erect, peristome teeth confluent at the base, hyaline at the tips. Autumn. Wet rocks in streams. Not reported.

#### 4. CIRRIPHYLLUM Grout.

Widely cespitose, glossy, light or yellowish green, robust; branches julaceous, often with flagellæ; scales uniform, very concave, ovate to oblong-ovate, base decurrent, margin plane, costa simple to the middle of the scale; sporangium cernuous to horizontal, ovoid to oblong-ovoid, lid long-rostrate, conic.

1. Robust; acumination short; seta smooth..... *C. boscii*
1. More slender; acumination one-half as long as the rest of the scale; seta rough..... *C. piliferum*

1. *C. piliferum* (Schreb.) Grout. (*Hypnum piliferum* Schreb.; *Eurynchium piliferum* Br. & Sch.) Yellowish-green, prostrate, creeping to 5 in. long, rather distinctly pinnate; scales oblong-ovate, abruptly piliferous acuminate, costa wide, alar cells enlarged; seta  $\frac{3}{4}$ -1 in., sporangium arcuate, strongly so when dry, segments equalling the teeth in length, cilia non-appendiculate. Autumn; rarely fruiting. Wet soil and bases of trees in woods and swamps. Champaign.

2. *C. boscii* (Schweg.) Grout. (*H. boscii* Schwaeg.; *Eurynchium boscii* Jaeg.) Loose deep mats, yellowish-green, dark below, prostrate with erect simple branches to 5 in. long; scales oblong-ovate, abruptly

acuminate, acumination twisted, costa simple, or short and double, alar cells and indistinct group, seta 1 in. or more long, golden-brown, sporangium slightly arcuate, inclined. Autumn. Soil or rocks in moist open woods or fields. Champaign, Clark, Fairfield, Lawrence, Muskingum.

#### 5. EURYNCHIUM Br. & Sch.

Cespitose, yellowish-green or green; scales rather dense, usually plicate, costa to the middle or farther, somewhat decurrent, margin plane, serrate; lid with a long needle-like beak.

1. Scales spreading; branches elongated. .... *E. pulchellum*
1. Scales appressed-imbricate; branches julaceous, short. .... *E. diversifolium*

1. *E. pulchellum* (Hedw.) Jenn. (*Hypnum pulchellum* Hedw.; *Hypnum strigosum* Hoff.; *Eurynchium strigosum* Br. & Sch.) Loosely cespitose, stoloniferous branches ascending; gradually attenuate, bright yellowish-green; scales ovate-lanceolate, concave, slightly plicate, costa four-fifths length and ending in a spine on the back; seta smooth, golden-brown, sporangium oblong-ovate, somewhat arcuate, inclined to horizontal; teeth confluent at the base, hyaline at the top. Autumn. Soil, logs, and roots of trees in moist open woods. Lake, Clark.

2. *E. diversifolium* Br. & Sch. (*Hypnum diversifolium* Schimp.) Denser, yellowish-green, branches not erect; scales dense, ovate, those of the branches obtuse. Fairfield.

#### 6. BRYNHIA Kaurin.

Loosely cespitose, dark green to yellowish or brownish; procumbent or stoloniferous, branches irregularly pinnate; scales loosely imbricated, concave, plicate, decurrent, serrate, costa single, ending near the middle of the scale; seta rough; sporangium cernuous, inclined to horizontal, gibbous dorsally, teeth confluent at the base, apically papillose, calyptra short and thick-rostrate.

1. Branch scales acute to short-acuminate, apex twisted. .... *B. novae-angliae*
1. Branch scales long-acuminate; apex not twisted. .... *B. graminicolor*

1. *B. novae-angliae* (Sull. & Lesq.) Grout. (*Hypnum novae-angliae* Sull. & Lesq.; *Brachythecium novae-angliae* Jaeg. & Sauer.) Bright green above, brownish-green below, branches ascending, distinctly julaceous; scales loosely imbricated when dry, erect-spreading when moist, ovate-lanceolate, margin plane, ovate to ovate-lanceolate, dorsally papillose by projecting cell-angles, costa to the middle; perichaetial scales long-acuminate, ecostate, seta and sporangium dark reddish-brown; sporangium oblong, slightly arcuate. Winter. Soil and rocks in wet, shady places. Lake.

2. *B. graminicolor* (Brid.) Grout. (*Hypnum sullivantii* Spruce.) Loosely to densely cespitose, yellowish-green below, light green, branches erect, short; branch scales ovate-lanceolate, long-acuminate, reflexed below, sharply serrulate, perichaetial scales longer, faintly costate; seta glossy, sporangium reddish-brown, arcuate, inclined to horizontal, somewhat gibbous below, calyptra long-rostrate, curved upward. Winter. Moist shady soil and wet rocks. Clark, Fairfield.

## 7. OXYRYNCHIUM (Br. &amp; Sch.) Warnst.

Loosely to densely cespitose, creeping, branches irregularly pinnate or fascicled, often complanate, scales non-plicate, only slightly concave, erect-spreading on branches, ovate, plane, serrulate, costa to the middle or beyond, often ending in a dorsal spine; seta rough, sporangium cernuous, inclined to horizontal, dorsally gibbous.

1. Aquatic, seta smooth..... *O. riparioides*
1. Terrestrial, seta rough..... *O. hians*

1. *O. riparioides* (Hedw.) Jenn. (*Hypnum riparioides* Hedw.; *Hypnum rusciforme* Neck.; *Eurynchium rusciforme* Milde.; *Rhynchostegium rusciforme* Br. & Sch.) Robust, loosely cespitose, dark, blackish below; primary stems creeping branches erect or ascending; scales ascending or erect-spreading, ovate to oblong, costa to beyond the middle of the scale, perichaetial scales ecostate, abruptly acuminate; seta castaneous, sporangium ovate to ovoid-oblong, inclined to horizontal, constricted below the mouth, lid obliquely rostrate. Early autumn. On dripping rocks or on stones in streams. "Ohio," by Lesquereux. No specimen in the herbarium.

2. *O. hians* (Hedw.) Jenn. (*Hypnum hians* Hedw.; *Eurynchium hians* Jaeg. & Sauer.; *Hypnum praelongum* Muell.; *Pterogynandrum apiculatum* Brid.) Loosely depressed-cespitose, light to yellowish-green, glossy; scales rather distant, erect-spreading, ovate, non-decurrent, blunt-acute to short-acuminate, often twisted, serrate, rough by thickened angles of the cells, costa  $\frac{1}{2}$ - $\frac{3}{4}$  length of the scale, ending in a dorsal spine; seta castaneous, sporangium arcuate, inclined to horizontal, oblong-cylindrical. Autumn. Champaign, Perry.

## 8. RHYNCHOSTEGIUM Br. &amp; Sch.

Cespitose, soft; creeping, irregularly pinnate scales dense, non-plicate, narrowed at the base; seta smooth.

1. *R. serrulatum* (Hedw.) Jaeg. (*Hypnum serrulatum* Hedw.; *Eurynchium serrulatum* Lindb.) Loosely cespitose, bright green, lustrous when dry complanate; scales concave, ovate-lanceolate, costa to the middle, serrulate in the outer portion; apex often twisted, margin plane; seta  $\frac{3}{4}$ -1 $\frac{1}{4}$  in. long, glossy, sporangium castaneous, arcuate, oblong, constricted below the mouth when dry. Autumn. Soil, logs and roots of trees in moist shade. Clark, Lake.

## 12. HYPNACEÆ.

Various, cespitose, irregularly pinnate, often quite regularly pinnate; scales plurisrate, unistratose, erect-spreading or squarrose to imbricated, often secund or circinate, costa various, basal cells usually differentiated and mostly hyaline; seta elongated, sporangium usually arcuate, inclined to horizontal, peristome double, teeth usually confluent at the base, basal membrane of inner peristome high, segments keeled, calyptra obtuse to acute or short-rostrate.

1. Costa single to middle of scale or beyond..... 2
1. Costa double or none..... 6

2. Costa strong, percurrent or excurrent..... 3
2. Costa not reaching the apex..... 5
3. Paraphyllia numerous..... *Hygroamblystegium*
3. Paraphyllia few or none..... 4
4. Scales blunt and rounded at the apex, spreading or imbricated.... *Calliergon*
4. Scales acute to acuminate, secund..... *Drepanocladus*
5. Scales erect-spreading..... *Amblystegium*
5. Scales squarrose recurved..... *Campylium*
6. Stem and branch scales dissimilar, scales symmetric and at right angles to the stem..... 7
6. Stem and branch scales similar, often inserted obliquely on the stem and unsymmetric..... 12
7. Paraphyllia numerous, annual growth clearly defined..... *Hylocomnium*
7. Paraphyllia few or none..... 8
8. Stem scales somewhat squarrose-spreading to secund, acuminate..... 11
8. Stem scales imbricated, with tips somewhat spreading or secund..... 9
9. Rugose; scales narrowly lanceolate, acuminate, base broad; serrate at the apex..... *Rhytidium*
9. Scales broadly ovate or rounded, apex obtuse, faintly crenulate at the apex..... 10
10. Stems green; in swamps..... *Acrocladium*
10. Stems red; in dryer places..... *Hypnum*
11. Irregularly and distantly pinnate; scales squarrose..... *Rhytidiadelphus*
11. Closely pinnate; scales circinate-secund..... *Ctenidium*
12. Scales complanate; branches irregular..... 13
12. Scales not complanate; branches more regularly pinnate, often plumose.... 14
13. Scales decurrent, alar cells differentiated..... *Plagiothecium*
13. Scales not or little decurrent, alar cells little or not at all differentiated, *Isopterygium*
14. Scales falcate, circinate, or secund..... 15
14. Scales mostly spreading..... 16
15. Very irregularly pinnate; scales plicate; paraphyllia numerous..... *Ptilium*
15. Irregularly pinnate; scales scarcely or not at all plicate; paraphyllia few or none..... *Stereodon*
16. Scales strongly falcate-secund, obtuse or apiculate, alar cells distinctly differentiated; aquatic..... *Scorpidium*
16. Not secund; scales erect-spreading; not aquatic..... 17
17. Paraphyllia numerous; medium-sized mosses..... *Heterophyllum*
17. Paraphyllia lacking; small plants..... 18
18. Dull; scales lanceolate to linear-lanceolate; cells rhomboidal to elongate-hexagonal..... *Amblystegiella*
18. Shining; scales oval to oblong-lanceolate; cells narrow..... *Homomallium*

### 1. ISOPTERYGIUM Mitt.

Slender, caespitose, light or yellowish-green, glossy, irregularly-pinnately branched mostly; scales smooth, base narrow, margin plane, costa very short or none; seta smooth, sporangium actinomorphic or weakly gibbous, rarely arcuate, bases of peristome teeth confluent, yellowish, apically hyaline; operculum conic, sometimes rostrate.

1. Scales entire or obscurely serrulate above..... 2
1. Scales distinctly serrulate at least in the outer half..... 3
2. Not complanate; two rows of cells at the base shorter and wider.... *I. pulchellum*
2. Complanate, basal cells hardly different..... *I. mullerianum*
3. Scales shortly bi-costate..... *I. geophyllum*
3. Scales ecostate or obscurely costate..... 4
4. Scales serrulate to the base..... *I. deplanatum*
4. Scales serrulate only in the outer half..... *I. turfaceum*

1. *I. mullerianum* (Schimp.) Lindb. (*Plagiothecium mullerianum* Schimp.; *Hypnum mullerianum* Hook. f.) Light green, yellowish,

laxly cespitose, branches often stoloniferous or flagelliform; scales ovate-lanceolate, concave, costa very faint, abruptly apiculate, pointing upward; seta castaneous, hypophysis elongated, sporangium erect to inclined, small, rare. Autumn. Rock crevices or soil in ravines. "Ohio," by Lesquereux. No specimen in the herbarium.

2. *I. deplanatum* (Sull.) Mitt. (*Hypnum deplanatum* Sull.; *Rhynchostegium deplanatum* Schimp.) Bright green, glossy, flattened; scales dense, concave, ovate-lanceolate, thin; sporangium oblong-ovate, arcuate, cernuous, plicate when dry. Autumn, fruit rarely found. Clark.

3. *I. pulchellum* (Dicks.) Jaeg. (*Hypnum pulchellum* Dicks.; *Plagiothecium pulchellum* Br. & Sch.) Lustrous green, densely cespitose; stems prostrate, branches erect, crowded; scales crowded, sometimes secund, ovate-lanceolate, long, slender acuminate, ecostate, narrowed at the base; sporangium sub-erect to inclined. Summer. Decayed wood, rocks and roots of trees. Champaign.

4. *I. turfæum* Lindb. (*Hypnum turfæum* Lindb.; *Plagiothecium turfæum* Lindb.; *Stereodon turfæum* Mitt.) Loosely cespitose, light to yellowish-green, prostrate with short branches; scales complanate, ovate-lanceolate, long-acuminate, basal cells wider and shorter; seta castaneous, sporangium oblong, oblique rostrate, slightly arcuate, plicate when empty, annulus large and double. Summer. Lake.

5. *I. geophilum* (Aust.) Jaeg. (*Rhynchostegium geophilum* Aust.; *Plagiothecium geophilum* Grout; *Hypnum depressum* Sull. & Lesq.) Loosely cespitose dark, glossy green, prostrate, irregularly branched; scales flat, rather distant, widely spreading, narrowed and rounded at the base, oblong-lanceolate, serrate in the outer half, apex rather blunt, a few basal cells sub-rectangular and hyaline; sporangium ovoid, inclined gibbous, operculum obliquely rostrate. Rare. Wet earth or stones near water in lowlands. Clark.

## 2. PLAGIOTHECIUM Br. & Sch.

Softly cespitose, larger than the preceding genus, bright to yellowish-green, lustrous, creeping to erect or ascending in thick mats, stoloniferous, branches often flagelliform; scales non-plicate, decurrent, ovate to lanceolate, acuminate, base narrowed, basal cells lax and hyaline; seta reddish, sporangium erect to cernuous, oblong to cylindrical, peristome yellowish, teeth confluent at the base.

1. Ascending, not distinctly complanate, spreading.....*P. roseanum*
1. Stems depressed, distinctly complanate..... 2
2. Costa strong, forked, often to the middle of the scale; sporangium striate when dry.....*P. sylvaticum*
2. Costa thin and short; sporangium usually smooth when dry....*P. denticulatum*

1. *P. sylvaticum* (Huds.) Br. & Sch. (*Hypnum sylvaticum* Huds.; *H. denticulatum* C. Muell.) Softly cespitose, duller, olive or yellowish-green, prostrate, stoloniferous; scales concave, oval-lanceolate, decurrent, narrowed at the base, abruptly acute, plane, shrinking when dry so as not to overlap, perichaetial scales long-acuminate, non-costate; seta castaneous, slender,  $\frac{3}{4}$ -1½ in. long or more, sporangium yellowish,

arcuate, inclined, hypophysis elongated, striate, peristome orange below, pale above, lid conic, rostrate. Summer. Soil, rocks and wood in the woods. Fairfield, Franklin, Lake.

2. *P. denticulatum* (L.) Br. & Sch. (*Hypnum denticulatum* L.) Flatly cespitose, pale green, lustrous, branches ascending; scales rather dense, sub-concave, little shrunk when dry, ovate-oblong, acute to short-acuminate, entire below, slightly denticulate near the apex, margin plane, widest at the base; seta 1-1¼ in., copper-colored, sporangium arcuate, cylindric, suberect to horizontal, hypophysis long, lid conic, peristome hyaline above. Summer. Logs, stones and humus in the woods. Ashtabula, Fairfield, Franklin, Hancock.

3. *P. roseolum* Br. & Sch. (*P. sullivantiae* Schimp.; *Hypnum roseanum* Hampe.) Densely cespitose, yellowish-green, shining; sparingly branched; scales dense, ovate-oblong, short-acuminate, concave, serrulate near the apex, costa distinct; sporangium oblong-cylindrical, erect to inclined, lid oblique-rostrate, short. Summer. Stones and soil in swampy woods. Clark, Fairfield, Lake.

### 3. AMBLYSTEGIUM Br. & Sch.

Cespitose, irregularly branched, branches more or less erect; scales erect-spreading to squarrose, acuminate, concave, non-plicate, costa thin to the middle or beyond; seta long, reddish or castaneous; sporangium arcuate, yellow or orange, constricted below the mouth when dry, lid conic.

- |   |                       |
|---|-----------------------|
| 1. Costa nearly percurrent to excurrent.....  | 2                     |
| 1. Costa ending well below the apex, usually near the middle.....                             | 4                     |
| 2. Sharply and finely denticulate; median cells 6-10: 1; very slender, densely tufted.....    | <i>A. compactum</i>   |
| 2. Larger; obscurely denticulate or entire; median cells 3-6: 1.....                          | 3                     |
| 3. Scales ovate-acuminate, acute, slender acuminate.....                                      | <i>A. varium</i>      |
| 3. Scales ovate-cordate, abruptly and bluntly acuminate.....                                  | <i>A. orthocladon</i> |
| 4. Slender, creeping; scales erect-spreading; median cells 2-6: 1.....                        | 5                     |
| 4. More robust, ascending; scales wide to squarrose-spreading; median cells 5-10 (15): 1..... | <i>A. riparium</i>    |
| 5. Median cells 2-4: 1.....   | <i>A. serpens</i>     |
| 5. Median cells 4-6 (8): 1.....   | <i>A. radicle</i>     |

1. *A. serpens* (L.) Br. & Sch. (*Hypnum serpens* L.) Very small and slender in thin compressed, dull mats, densely interwoven, prostrate, radiculose, irregularly branched; scales ovate-lanceolate, long-acuminate; serrulate to entire, decurrent, narrow at the base, plane, costa often faint; seta slender, ¾-1 in. long, sporangium strongly arcuate, lid apiculate, teeth pale. Early summer. Bases of trees, roots, long, soil, rocks, etc., in moist woods. Clark, Lake, Seneca.

2. *A. varium* (Hedw.) Lindb. (*Leskea varia* Hedw.; *Stereodon varius* Mitt.; *Hypnum debile* Brid.) Mats of varying density, dark green below, lighter above, prostrate, branches erect or ascending, irregular; scales rather dense; ovate-acuminate, entire or slightly denticulate, plane erect-spreading, decurrent, narrowed at the base, costa strong and well above the middle, basal cells larger and sometimes yellowish; seta ¾-1¼ in., castaneous, sporangium castaneous, strongly

arcuate. Spring. Stones, wood, bases of trees, etc., in moist places. Clark, Fairfield, Fulton, Lawrence, Logan, Montgomery.

3. *A. radicale* (Beauv.) Mitt. (*A. serpens* var. *radicale* Aust.; *Hypnum radicale* Beauv.; *Hypnum bergense* Aust.; *Campylium radicale* Grout; *A. hygrophilum* (Jur.) Schimp.) Loose thin mats, pale-green, slender and little branched; scales distant, spreading, lanceolate to ovate-cordate, decurrent, slenderly acuminate, alar cells often enlarged and hyaline, costa orange; seta an inch or more in length, castaneous, sporangium yellowish, peristome teeth hyaline margined, sporangium castaneous. Spring. Rotten logs, roots, soil, in wet shady places. Lake.

4. *A. orthocladon* (Beauv.) Jaeg. (*A. varium* var. *orthocladon* Husnot.; *Hypnum orthocladon* Beauv.) Dark to olive-green, compact, irregularly branched, branches erect; scales ovate-cordate, wide-spreading, base narrow, margins plane, serrulate, costa to the apex; seta castaneous, sporangium castaneous, arcuate, cernuous, constricted below the mouth when dry. Spring. Moist, shady stones, and rotten wood at the bases of trees. Clark, Fairfield, Franklin, Fulton, Lake, Logan, Montgomery.

5. *A. riparium* (L.) Br. & Sch. (*H. riparium* L.; *H. laxifolium* Brid.; *Stereodon riparium* Mitt.) Variable in loosely cespitose flat, soft tufts or floating in running water, creeping, sub-pinnate,  $\frac{3}{4}$ –1 in. or more in length, 2–3 in. in floating forms, depressed; scales widely spreading, sometimes secund at tips, ovate-lanceolate to oblong-lanceolate, gradually and finely acuminate, flat, somewhat decurrent, rounded at the base, costa strong; sporangium oblong-cylindric, dark, lid apiculate. Spring. Clark, Champaign, Franklin, Lake.

6. *A. compactum* (C. Muell.) Aust. (*Hypnum compactum* C. Muell.) Small, densely cespitose, light or yellowish-green, branches numerous; scales erect-spreading, lanceolate to ovate-lanceolate, long-acuminate, finely denticulate, seta short, sporangium erect or slightly inclined. Rotten logs or wet bases of trees. Champaign.

#### 4. AMBLYSTEGIÉLLA Loesk.

Slender, filiform, creeping; scales erect-spreading or sometimes slightly secund, lanceolate to lance-subulate, margin plane, entire, costa faint or none; seta castaneous or reddish-yellow, sporangium usually erect and actinomorphic, constricted below the mouth when dry, peristome yellow, teeth confluent and bordered, cilia rarely complete.

1. Plants minute; scales not narrowed at the insertion.....*A. minutissima*
1. Plants larger; scales narrowed at the insertion.....*A. conferva*

1. *A. minutissima* (Sull & Lesq.) Nichols. (*H. minutissimum* Sull. & Lesq.; *Amblystegium minutissimum* Jaeg.) Light green, prostrate, radicles fasciculate, branches erect or spreading; scales triangular, faintly serrate, ecostate; sporangium minute, ovoid, turbinate, when empty, lid conic, apiculate-rostrate. Rocks and stones in ravines. "Ohio," L. & J. Manual.

2. *A. conferva* (Schweg.) Jenn. (*Hypnum confervoides* Brid.; *Amblystegium confervoides* Loesk.; *Hypnum conferva* Schweg.) Dark green, irregularly branched; scales rather distant, almost or quite entire, ovate, acuminate ecostate, somewhat appressed; sporangium arcuate, inclined, reddish-brown. Summer. Green, Clark.

#### 5. HOMOMALLIUM (Schimp.) Loeske.

Shining, slender, creeping, pinnately branched with branches erect or ascending; scales erect-spreading, often secund at the tips, concave, non-plicate, ovate to oblong-lanceolate, long-subulate, plane, ecostate, or costa double, short and faint; seta reddish, sporangium inclined to horizontal, strongly arcuate when dry, constricted below the mouth, peristome yellow, teeth confluent basally, operculum short-rostrate.

1. *H. adnatum* (Hedw.) Broth. (*Hypnum adnatum* Hedw.; *Amblystegiella adnata* Nichols; *Stereodon adnatum* Mitt.) Densely cespitose, light green above, darker below, branches close; scales dense, entire or nearly so, concave, recurved below; seta  $\frac{1}{2}$ – $\frac{3}{4}$  in. long, hypophysis long, sporangium reddish. Autumn. Clark, Franklin.

#### 6. HYGOAMBLYSTEGIUM Loeske.

Cespitose, dark green, dull, aquatic, often floating, pinnately branched; scales dense, spreading to secund, concave, non-plicate, ovate to lanceolate, long-acuminate, costa stout; seta castaneous, sporangium arcuate and constricted below the mouth when dry.

- |  |                      |
|--|----------------------|
| 1. Scales entire or obscurely serrate, non-decurrent.....        | 2                    |
| 1. Scales distinctly serrate, teeth small; mostly decurrent..... | <i>H. filicinum</i>  |
| 2. Scales sharply acute or acuminate.....                        | <i>H. tenax</i>      |
| 2. Scales obtuse, not acuminate.....                             | <i>H. fluviatile</i> |

1. *H. fluviatile* (Swartz) Loeske. (*Amblystegium fluviatile* Br. & Sch.; *Hypnum fluviatile* Swartz.) Robust, gametophores to 4 in. long, olive or dark green, or blackish, naked below; scales oblong-lanceolate to oblong-ovate, remote, erect-spreading, concave, recurved at base, costa percurrent, yellowish, basal cells often yellowish or orange; seta about  $\frac{1}{2}$  in. long, sporangium oblong-cylindrical, sub-erect, yellowish, brown, slightly curved; teeth strongly confluent at the base, hyaline and papillose at the apex, cilia nodose, three. Early summer. Earth and stones near running water in non-calcareous districts. Clark, Fairfield.

2. *H. tenax* (Hedw.) Jenn. (*H. irriguum* Loeske; *Hypnum irriguum* Wils.; *Amblystegium irriguum* Br. & Sch.; *Hypnum tenax* Hedw.) Cespitose, dark green, rigid, irregularly branched, pinnate, with long paraphyllia at the insertion of the branches; scales deltoid-ovate-lanceolate, gradually long-acuminate, somewhat narrowed at the base and slightly decurrent, spreading, somewhat secund at the tips, cost percurrent, basal cells enlarged, yellowish; seta  $\frac{1}{2}$  in. long, sporangium brown, oblong, lid apiculate, peristome orange, pellucid. Late spring and early summer. Earth or stones in swampy places in non-calcareous regions. Greene, Wyandot.



3. *H. filicinum* (L.) Loeske. (*Amblystegium filicinum* DeNot.; *Stereodon filicinus* Mitt.; *Hypnum filicinum* L.; *Cratoneuron filicinum* G. Roth; *Hypnum compressum* Brid.) Variable, tufted, 2-4 in. deep, bright to yellowish-green, brown below, densely tomentose, paraphyllia lacinate, quite regularly pinnate; scales cordate-deltoid, gradually slender-acuminate, erect-spreading, secund at the tips of the gametophores, non-plicate; costa percurrent, alar cells inflated, hyaline or colored, auricled; seta 1-1½ in. long, sporangium sub-cylindric. Spring. On earth or stones in springs or streams in limestone regions. Champaign, Lake.

#### 7. DREPHANOCLADUS (C. Muell.) Roth.

Robust, usually glossy, stems procumbent to erect or floating; scales strongly secund, concave, decurrent, acute to long-acuminate, costa thin, usually single, smooth, basal cells hyaline or yellowish, well-defined; seta long, sporangium cylindric, arcuate, constricted below the mouth when dry, lid apiculate.

1. Alar cells not inflated or decurrent, but thicker and broader, scales entire.....*D. revolvens*
1. Alar cells distinctly enlarged and inflated, often either decurrent or serrate or both..... 2
2. Scales entire, alar cells greatly enlarged..... 4
2. Some or all scales plainly dentate..... 3
3. Scales plicate.....*D. uncinatus*
3. Scales not plicate.....*D. fluitans*
4. Acumen flat, scarcely or not at all hooked.....*D. kneifii*
4. Acumen channeled, tips hooked..... 5
5. Gradually long-acuminate.....*D. aduncus*
5. Abruptly short-acuminate.....*D. aduncus* var. *gracilescens*

1. *D. uncinatus* (Hedw.) Warnst. (*Hypnum uncinatus* Hedw.; *Amblystegium aduncum* Lindb.; *Hypnum aduncum* L.) Densely cespitose, light to golden-green, irregularly pinnate; scales dense, falcate to circinate, lanceolate, acuminate long, dentate above, costa into the acumen, strongly plicate, basal cells only slightly enlarged and inflated; seta 1 in. or more long, copper colored, sporangium reddish-orange, arcuate. Early summer. Earth, stones, logs and bases of trees in moist shady places. Champaign, Clinton, Fairfield, Franklin, Lake.

2. *D. revolvens* DeNot. (*Hypnum revolvens* Sw.) More robust, 2-3 in. deep, loosely tufted, yellowish or light green above, dark reddish-purple below; scales linear-lanceolate, long slender-acuminate, costa to above the middle; sporangium erect, cernuous, oblong-ovoid, scarcely constricted below the mouth when dry. In wet soil. Reported from the swamps of northern Ohio by Lesquereux.

3. *D. aduncus* (Hedw.) Warnst. (*Hypnum aduncus* Hedw.; *Amblystegium watsonii* (Sch.) Lindb.) Slender and soft, green or golden green, darker below; scales rather distant, moderately hooked at the tip of branch, wide cordate at base, strongly excavate, forming a complete semicircle between the auricles, costa to about ¾ the length of the scale, lanceolate, often twisted, basal cells abruptly inflated; the scale, seta 1 in. or more long, sporangium oblong, arcuate, inclined. Wet soil and stones or floating in deep pools. Champaign, Lake.

4. *D. aduncus* var. *gracilescens* Br. & Sch. (*D. subaduncus* Warnst.) Sparingly branched, branches short and erect, yellowish-green; scales ovate to ovate-lanceolate, base less deeply and widely excavate than in the species. Late spring. Swamps and wet places. Fruit rare. Lake.

5. *D. kneiffi* (Schimp.) Warnst. (*Hypnum aduncum* var. *kneiffi* Schimp.; *Amblystegium kneiffi* Br. & Sch.) Branches slender, long and flexuous; little hooked at the tips; scales distant, narrow lanceolate, upper one wider and shorter, alar cells inflated, and extending to the costa. Late spring. Fruit rare. In water in swamps and streams. Not reported.

6. *D. fluitans* (L.) Warnst. (*Amblystegium fluitans* DeNot.; *Hypnum fluitans* L.) Soft tufts, 2-3 in. deep, irregularly pinnate, erect, light or yellowish-green above, brown below; scales secund, narrow or oblong-lanceolate, very long acuminate, non-plicate, costa extending into the acumen or percurrent, denticulate, not deeply excavate; seta 1 in. or more, copper-colored, sporangium arcuate, reddish-orange, annulus none. Summer. In water in swamps and streams. Clark.

#### 8. CALLIÉRGON (Sull.) Lindb.

Robust, erect; scales not falcate or secund obtuse, broadly oblong-ovate to almost orbicular, concave, costa simple and strong or wanting; sporangium arcuate, inclined to horizontal, peristome hypnoid.

1. Scales imbricate when dry; almost simple mosses..... 2
1. Scales erect-spreading or loosely imbricated; branched..... 3
2. Scales almost round, very obtuse; auricles indistinct..... *C. trifarium*
2. Scales oblong, auricles distinct..... *C. stramineum*
3. Sparingly branched, alar cells gradually passing to the ordinary cells,..... *C. cordifolium*
3. Much branched; alar cells abruptly differentiated from the ordinary cells..... *C. giganteum*

1. *C. cordifolium* (Hedw.) Lindb. (*Hypnum cordifolium* Hedw.; *Amblystegium cordifolium* DeNot.) Large mosses, 4-6 in. tall, light green, loose tufts, stalks erect, slender; scales distant, widely spreading, ovate-cordate, entire, decurrent; seta to 2 in. long, castaneous, sporangium golden-brown. Summer. Swamps or margins of pools or sluggish streams. Lake.

2. *C. giganteum* (Schimp.) Lindb. (*Hypnum giganteum* Schimp.; *Amblystegium giganteum* DeNot.) Very robust, 3-6 in. tall, loosely tufted, stalks thick, pinnately branched, bright green, brown below; scales oblong, alar cells hyaline; seta castaneous, 2 in. or more long, sporangium distinctly arcuate, brown. Late spring and early summer. Swamps and bogs. Champaign.

3. *C. stramineum* (Dicks.) Lindb. (*Hypnum stramineum* Dicks.; *Amblystegium stramineum* DeNot.) Pale green, loose tufts, 2½-3 in. deep, stems erect and slender; scales oblong-ovate to oblong, costa to beyond the middle, alar cells hyaline, forming distinct decurrent auricles, a patch of shorter cells in the apex; sporangium oblong-cylindrical. Summer. In bogs, often among sphagnum. Erie.

4. *C. trifarium* (Web. & Mohr.) Kindb. (*Hypnum trifarium* Web. & Mohr.; *Amblystegium trifarium* DeNot.) Robust, golden or dirty green above, brown below, tufts loose, prostrate to erect, stiff and brittle when dry; scales loosely imbricated, ovate, wide slightly decurrent, entire, wide near the middle, alar cells enlarged and hyaline; sporangium cernuous, horizontal, reddish. Bogs and pools. Erie.

#### 9. SCORPIDIUM (Schimp.) Limpr.

Very robust, sparingly branched, branches fastigate; scales strongly secund, imbricate, turgid, broad-ovate, costa indistinct or none.

1. *S. scorpioides* (L.) Limpr. (*Hypnum scorpioides* L.; *Amblystegium scorpioides* Lindb.) Soft tufts, brownish-green, above, almost black below, branches erect or ascending, almost simple, 4-6 in. long; scales very concave, imbricated, rugose, non-plicate, ovate-oblong, narrowed at the base, entire, costa very short and double, obtuse or apiculate, a few basal cells wider and hyaline; seta long, sporangium arcuate, not constricted below the mouth when dry. Late summer. Bogs and marshes in the water. Champaign. "Cranberry marshes of northern Ohio," Lesq.

#### 10. CAMPYLIUM (Sull.) Mitt. (*Chrysohypnum* [Hampe.] G. Roth.)

Soft thin mats; scales ovate-acuminate, acute, widely spreading, squarrose, or secund not falcate; sporangium arcuate, usually contracted below the mouth when dry, lid conic-convex, peristome hypnoid.

- |  |                        |
|--|------------------------|
| 1. Costa single, distinct, half the length of the scale..... | <i>C. chrysohypnum</i> |
| 1. Costa short and double or wanting.....                    | 2                      |
| 2. Stems prostrate; scales serrulate.....                    | <i>C. hispidulum</i>   |
| 2. Stems erect or ascending; scales entire.....              | <i>C. stellatum</i>    |

1. *C. hispidulum* (Brid.) Mitt. (*Hypnum hispidulum* Brid.) Thin tufts, small, slender, creeping, bright green, irregularly branched; scales widely spreading to squarrose, triangular-cordate, abruptly acuminate, decurrent; seta copper-colored, 1 in. long, sporangium light, much curved, mouth wide. Early summer. Wood, humus and roots of trees in moist woods. Champaign, Clark, Fairfield, Franklin, Fulton, Geauga, Lake, Lawrence, Richland.

2. *C. chrysophyllum* (Brid.) Bryhn. (*Hypnum chrysophyllum* Brid.; *Hypnum polymorphum* Br. & Sch.) Thin, delicate, loose mats, bright or yellowish-green, creeping, irregularly branched; scales squarrose-spreading, base narrowed, somewhat clasping, occasionally secund, ovate-cordate, abruptly acuminate; seta copper-colored, sporangium much curved, peristome light. Early summer. Earth, wood and stones in moist places. Champaign, Clark, Fairfield, Greene, Montgomery, Pickaway, Seneca, Lake.

3. *C. stellatum* (Schreb.) Bryhn. (*Hypnum stellatum* Schreb.; *Amblystegium stellatum* Lindb.) Robust, 2-4 in. tall, variable in appearance, soft tufts, bright green, brown below; scales squarrose or recurved, bistriate at base, alar cells inflated, hyaline or colored, base ovate or cordate, rather abruptly acuminate; seta brown, sporangium

dark reddish-brown, cernuous, constricted below the mouth when dry, teeth orange at the base, lighter above. Summer. Swamps, in water or on wet soil. Champaign.

### 11. CTENÍDIUM (Schimp.) Mitt.

Loosely cespitose, densely bi-pinnately branched, plumose; scales long-acuminate, circinate, secund, costa short and double; sporangium sub-horizontal, curved, thick-ovate, lid conical-apiculate.

1. *C. mollúscum* (Hedw.) Mitt. (*Hypnum molluscum* Hedw.) Wide soft mats, yellowish-green, stems to 3 in. long, prostrate, or ascending; scales cordate-triangular, auricled round, quadrate cells not much enlarged, pellucid crisped when dry, plane, serrate, decurrent, more or less rough by the projecting angles of the cells, paraphyllia few. Summer. Earth or stones in limestone regions. Champaign, Lake.

### 12. PTÍLIUM (Sull.) DeNot.

Robust in deep loose tufts, frondiform, stems rigid, closely and regularly pinnately branched; scales sulcate, seta long and slender, falcate, secund; sporangium arcuate to horizontal, oblong-cylindric.

1. *P. crista-castrénsis* (L.) DeNot. (*Hypnum crista-castrensis* L.) Bright, yellowish-green, darker below, 2-5 in. deep, strikingly plumose, branches horizontally divergent, about equal in length except at the tips; paraphyllia numerous; scales plicate, crowded, serrate in the outer part, alar cells enlarged, hyaline, decurrent, costa short and double or wanting; seta reddish-brown, sporangium lighter, 1-1½ in. long, lid large, teeth orange at the base. Summer. Earth or rotten logs in wet woods. "Northern Ohio," H. C. Beardsley.

### 13. HYLOCÒMNIUM Br. & Sch.

Robust, loosely cespitose, paraphyllia abundant in our species, annual growth well marked, plumose, tripinnate, or bipinnate; scales occasionally papillose on the back by projecting angles, basal cells often colored; sporangium curved, inclined to horizontal, peristome hypnoid.

1. Regularly bi- or tri-pinnate; stem scales gradually acuminate, not auricled,  
*H. splendens*
1. Irregularly pinnate; stem scales abruptly acuminate; auricled. *H. brevirostre*

1. *H. brevirostre* (Ehrh.) Br. & Sch. (*Hypnum brevirostre* Ehrh.) Tufts large, 3-5 in. deep, coarse, rather rigid, paraphyllia small; stem scales spreading, squarrose, or sub-secund, obcordate-ovate to cordate-triangular, faintly bi-costate, serrulate above, auricles rounded; sporangium arcuate, turgid-oblong, ovate, lid acuminate, sub-rostrate, or long conical, teeth orange. Spring. Rocks and bases of trees in wet ravines. Lake.

2. *H. splendens* (Hedw.) Br. & Sch. (*Hypnum proliferum* L.; *Hylocomnium proliferum* Lindb.; *Hypnum splendens* Hedw.) Loose rigid tufts pale green above, darker below, paraphyllia branched, annual growth arcuate; stem scales wide-ovate to oblong-ovate, rather

abruptly acuminate, acumen long, plicate, concave, basal cells orange, costa obscure, double; sporangium turgid-ovate, lid rostrate. Spring. Log and stones in moist woods. Cuyahoga.

#### 14. HYPNUM (Dill.) L.

Robust, prostrate to ascending, irregularly pinnate; scales loosely imbricated, costa double and short or none, obtuse, deeply concave; sporangium oblong, arcuate, lid conic-convex.

1. *H. schreberi* Wild. (*Hylocomnium schreberi* DeNot.; *Hypnum parietum* L.; *Hylocomnium parietum* Lindb.) Densely cespitose, cushions 2-5 in. deep, pale grayish-green or olive green, glossy, older stems bright red; scales ovate to oblong, dense, obtuse, incurved at the apex, plicate, entire or slightly crenulate in outer portion, alar cells enlarged, hyaline or colored; sporangium inclined, reddish, annulus none, seta purple. Fruit rare. Autumn. Dry open woods, banks, etc. Champaign, Lake.

#### 15. RHYTIDIUM (Sull.) Lindb.

Robust, non-radiculose, irregularly pinnate, paraphyllia lacking; scales plicate, costa simple to beyond the middle, calyptra large, lid rostrate, annulus broad.

1. *R. rugosum* (Ehrh.) Lindb. (*Hypnum rugosum* Ehrh.; *Hylocomnium rugosum* DeNot.) Large, 2-4 in. deep, dense mats, bright yellowish-green, glossy, tumid; scales strongly secund, papillose on back, transversely undulate-rugose, revolute, denticulate, alar cells numerous, quadrate; sporangium oblong-cylindric, deeply arcuate, constricted below the mouth when dry. Fruit rare. Summer. Dry banks among the grass and on ledges. Greene, Lake.

#### 16. RHYTIDIADÉLPHUS (Lindb.) Warnst.

Robust, irregularly and distantly bi- or tri-pinnate; scales squarrose or spreading-secund, paraphyllia lacking; sporangium turgid, ovate.

1. *T. triquétris* (L.) Warnst. (*Hypnum triquetrum* L.; *Hylocomnium triquetrum* Br. & Sch.) Very robust, wide tufts, 4-6 in. deep, yellowish to light green, stems stiff, reddish, erect or ascending, branches unequal, not complanate; scales widely spreading deltoid to broadly ovate, stiff, rarely secund, gradually tapering, acute, plicate, denticulate, papillose on the back; seta 1-1½ in. long, sporangium oblong, lid conic-acute, teeth orange with a yellow border. Spring. Soil in swampy or dry woods. Champaign, Fairfield, Lake.

#### 17. ACROCLADIUM Mitt.

Robust mosses, loosely tufted, irregularly pinnate; scales spreading, costa double and very short or ecostate, entire, obtuse; sporangium oblong, arcuate.

1. *A. cuspidatum* (L.) Lindb. (*Hypnum cuspidatum* L.; *Stereodon cuspidatus* Brid.) Bright or yellowish-green, glossy, branches cuspidate at the tips; lower scales erect-spreading, oblong-elliptical, rounded at the

apex, alar cells suddenly enlarged, hyaline or colored, auricles large and decurrent; seta  $1\frac{1}{2}$ – $2\frac{1}{2}$  in. long; sporangium strongly arcuate, golden-brown, teeth hyaline-bordered. Summer. Wet meadows, swamps and bogs. Summit.

### 18. STÉREODON (Brid.) Mitt.

Pinnately branched, more or less regularly; scales falcate-secund, smooth, acuminate, costa double or wanting; sporangium usually curved, sub-erect to inclined, lid short-rostrate.

- |  |                          |
|--|--------------------------|
| 1. Alar cells inflated, hyaline or colored.....              | 2                        |
| 1. Alar cells quadrate, not enlarged.....                    | 7                        |
| 2. Quite distinctly pinnate.....                             | 3                        |
| 2. Not distinctly pinnate.....                               | 6                        |
| 3. Sporangium sub-erect; stems reddish.....                  | 4                        |
| 3. Sporangium curved or inclined; stems not reddish.....     | 5                        |
| 4. Robust, closely pinnate, more or less complanate.....     | <i>S. imponens</i>       |
| 4. Slender, branches few, not complanate.....                | <i>S. tenuirostris</i>   |
| 5. Small yellowish; sporangium non-plicate.....              | <i>S. fertile</i>        |
| 5. Larger, dark green; sporangium plicate when dry.....      | <i>S. curvifolium</i>    |
| 6. Scales entire; alar cells rather few.....                 | <i>S. pratense</i>       |
| 6. Scales sharply serrate above; alar cells conspicuous..... | <i>S. recurvans</i>      |
| 7. Scales entire; not regularly pinnate.....                 | <i>S. cupressiformis</i> |
| 7. Scales serrulate, at least above; regularly pinnate.....  | <i>S. reptilis</i>       |

1. *S. reptilis* (Rich.) Mitt. (*Hypnum reptilis* Rich.) Small, dark or yellowish-green, loosely cespitose; scales dense, lanceolate-acuminate serrate above, usually serrulate below, lower margins revolute, alar cells quadrate, somewhat colored, costa yellowish when present; seta about  $\frac{1}{2}$  in. long, sporangium yellowish, curved near the mouth and narrowed, lid oblique-rostrate. Summer. Bases of trees, logs, etc., in woods. Clark.

2. *S. fertile* (Sendt.) Lindb. (*Hypnum fertile* Sendt.) Lustrous, densely cespitose, prostrate or ascending to 3 in. long, branches sparse, short; scales oblong-lanceolate, long and narrowly acuminate, concave, plane, entire below, serrulate above, narrowed at the base, a few alar cells inflated at the margin; seta  $\frac{1}{2}$ – $\frac{3}{4}$  in., castaneous, sporangium inclined to horizontal, oblong, arcuate, castaneous, rim darker, somewhat constricted below the mouth when dry, lid conic, acute. Wood decaying in moist places. Champaign.

3. *S. imponens* (Hedw.) Lindb. (*Hypnum imponens* Hedw.) Wide, densely interwoven, yellowish mats, stems prostrate, closely pinnate, forming flat fronds, paraphyllia numerous; scales ovate at base, gradually long-acuminate, strongly falcate-secund, somewhat complanate, margin usually recurved below, alar cells quadrate with a few inflated and orange pellucid in angles, auricled; seta slender, castaneous,  $1$ – $1\frac{1}{2}$  in. long, sporangium reddish-brown, slightly curved, nearly erect, lid long-rostrate, acuminate. Autumn or early winter. Stones, soil or wood in moist woods. Clark, Fairfield, Franklin, Greene, Lake, Lawrence, Licking.

4. *S. cupressiformis* (L.) Lindb. (*Hypnum cupressiformis* L.) Wide, densely interwoven mats, yellowish to brownish-green, variable in size, paraphyllia less numerous than in the preceding species, more

irregularly pinnate, prostrate; scales dense, imbricated, concave, oblong to ovate, abruptly acuminate, entire below, serrulate above, subulate, alar cells few, clear, usually hyaline; sporangium curved, oblong-constricted below the mouth when dry, lid acuminate. Late autumn or early winter. Earth, stones, roots of trees in moist woods. Lake, Seneca.

5. *S. cupressiformis* var. *ericetorum* (Br. & Sch.) (*Hypnum cupressiforme* var. *ericetorum* Br. & Sch.) Soft, pale green, lustrous; scales less dense than in the species, narrow and more widely spreading, circinate-falcate; sporangium shorter, lid short-subulate. Perry.

6. *S. cupressiformis* var. *filiformis* (Brid.) Jenn. (*Hypnum cupressiformis* var. *filiformis* Brid.) Slender, distantly pinnate, branches long, slender and parallel, mats thin; scales in two rows, imbricated. On soil rocks and rotten wood in moist woods. Franklin.

7. *S. curvifolius* (Hedw.) Brid. (*Hypnum curvifolium* Hedw.) Wide, flat, yellowish-green mats, branches short and unequal, closely pinnate, prostrate; scales in two rows, falcate-secund, appearing plaited from above, entire or serrulate in the outer part, concave, oblong-ovate to long-triangular-ovate, slightly decurrent with enlarged and hyaline cells, alar cells sub-quadrate; seta 1-1½ in. long, castaneous, sporangium light castaneous, constricted below the mouth when dry, arcuate, cernuous, teeth yellow-pellucid, lid conic-apiculate. Spring. Decaying logs, and rocks in cool moist woods. Champaign, Clark, Fairfield, Lake, Williams.

8. *S. pratense* (Koch.) Warnst. (*Hypnum pratense* Koch.; *Isopterygium pratense* Lindb.) Flatly cespitose, complanately branched, bright green; scales slightly concave or plane, only slightly secund, alar cells colored, few; sporangium non-plicate, ovate to oblong, cernuous, arcuate, seta twisted in two directions, fruit rare. Spring. Wet or swampy soil. Franklin.

9. *S. recurvans* (Rich.) Broth. (*Hypnum recurvans* Schwaeg.; *Sematophyllum recurvans* E. G. Britt.; *Leskea recurvans* Rich.; *Raphidiostegium recurvans* Jaeg.) Widely cespitose, yellowish green, glossy, complanately branched; scales strongly falcate-secund, dense, imbricated, concave, ovate-lanceolate, filiform-acuminate, narrowly recurved below, basal cells yellow, a few alar cells hyaline; seta ½-1 in. long, sporangium oblong-ovate, inclined, slightly arcuate, strongly so when old; lid conic, beak oblique, ½ the length of the sporangium, neck tapering. Late fall. Wood and soil at the base of trees. Fairfield, Lake.

10. *S. tenuirostris* (Br. & Sch.) Broth. (*Sematophyllum tenuirostris* E. G. Britt.; *Hypnum cylindrocarpum* C. Muell.; *Raphidiostegium cylindrocarpum* Jaeg.) Flatly cespitose, dense, in wide mats, branches, sparse; scales oblong-lanceolate, narrow, slenderly acuminate, margins recurved, concave; seta ½-¾ in. long, sporangium cylindric, almost or quite erect, brownish, peristome yellow, cilia rudimentary or wanting, lid with an oblique rostrum about one-half the length of the sporangium. Winter. Rotten logs and rocks, usually in hilly or mountainous regions. Champaign, Clark.

## 19. HETEROPHYLLON Lindb.

Various, paraphyllia large and numerous; scales erect-spreading, non-plicate, basal cells yellow, alar cells inflated, yellow or brownish, sharply differentiated, not falcate or secund.

1. *H. haldanianum* (Grev.) Lindb. (*Hypnum haldanianum* Grev.; *Stereodon haldanianum* Lindb.) Loose mats, brownish-green, irregularly pinnate scales loosely imbricated, stem scales broad, lance-ovate, short acuminate, auricles distinct and concave, bordered by quadrate cells; seta  $1\frac{1}{2}$ –2 in. long, castaneous, sporangium cylindrical inclined or sub-erect, slightly curved, lid short and sharp rostrate. Autumn and early winter. Earth, rocks, and decaying wood in woods. Fairfield, Lake, Perry.